

## ANESTHESIA IN THE AGED\*

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## INTRODUCTION

A DISCUSSION of anesthesia in the aged will have little meaning unless it is understood that no hard and fast generalizations concerning anesthetic agents or methods in geriatric practice are possible. The inference must not be drawn that all elderly patients above the "geriatric" age whether it be 60, 70 or 80 are necessarily best anesthetized in the same specific way. The fundamental principles of good anesthesia apply to these patients as to all others. However, it is true that some patients in the older age groups are so brittle that even a gentle breeze of anesthetic gas or vapor seems to be a dangerous stress. This presentation must, therefore, be concerned with problems presented to the anesthesiologist *more frequently* in aged than in younger patients.

Some of the problems that must be solved in satisfactory anesthetic management of aging patients have to do with the physiological derangements and clinical illnesses which have been detailed in other presentations during this Graduate Fortnight on Problems of Aging. These disturbances of normal function may be of considerable importance when one adds to the picture the powerful and depressant action of the anesthetic agents. If it is possible to generalize at all one can state that aged patients appear to have a diminished ability to detoxify or eliminate potent anesthetic and sedative drugs. Furthermore, they appear to tolerate anesthetic procedures in a response range more limited than that of younger patients. These statements are meant to suggest that the major disturbances of anesthesia for the aged patients are only quantitatively different from those of younger subjects. This is an oversimplification but a basically correct one.

It has been observed repeatedly that the effects of premedicant drugs upon aged patients are more pronounced than they are in younger

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patients.<sup>1</sup> The former are apt to suffer depression of ventilation and circulation when opiates or synthetic narcotics are used in the usual dosages. The doses of these drugs must be reduced to something between one third and one half of the usual therapeutic range if they are to be used at all. There is considerable question whether the narcotics for premedication are valuable or even safe for aged patients. Since secretion production in the airway is not as much of a problem as it is in younger patients, belladonna drugs are given in smaller doses than usual. There has been controversy as to the relative merits of atropine and scopolamine in geriatric practice. It is quite unusual in our experience to note the delirium commonly ascribed to scopolamine. Delirium is not only rare but it is most apt to occur only in association with intense pain. It is difficult to document but it has been stated that elderly patients tend to be somewhat philosophical about events in the latter years. This has struck some so forcefully that the selection of regional anesthesia in the fully conscious state has been regarded as both physiologically sounder and psychologically satisfactory for these patients.<sup>2</sup>

Other aspects of the preparation of elderly patients are of interest and significance to the anesthesiologist. It is not pertinent in this discussion to review all the elements of care directed at restoring cardiovascular function, ventilation, renal function, and other important physiological activities to a status as near normal as possible. These are self evident and are more properly the concern of the internist. However, one important aspect of this phase of preoperative preparation is frequently overlooked. The internist and the anesthesiologist do not always provide the maximum safeguards for an elderly patient or one with heart disease who may not be elderly. This deficiency is related to the occasional failure to appreciate a total problem. The anesthesiologist does not always inform the internist of the precise action of his drugs or his procedures upon a given patient and what further risk may be superimposed by anesthesia under these circumstances. The internist, on the other hand, is not always able to inform the anesthesiologist of how much functional disability may be expected in a patient with a diseased heart. The pious hope to provide "adequate oxygen and avoid a fall in blood pressure" is somewhat academic. The avoidance of anoxia and circulatory depression is basic to good clinical anesthetic care.

The preoperative preparation of elderly patients for major surgical procedures includes the important matter of insuring an adequate blood

volume. If one uses the standard reference of body weight with a reasonable allowance for the aging process, the blood volume in proportion to body weight is lower in many elderly people than it is in young adults.<sup>3</sup> A circulating volume defect prior to the induction of anesthesia becomes increasingly important since the elderly patient is less able to effect circulatory compensatory shifts provoked by the action of anesthetic agents and surgical procedures. Circulatory morbidity and mortality will, therefore, be increased if the circulating blood volume deficits are not properly corrected prior to the beginning of anesthesia and if significant losses of blood during operation are not corrected as they occur.

#### THE EFFECTS OF ANESTHESIA

In properly managed anesthesia, the mortality from the anesthetics need not be disproportionate nor a clinical deterrent to the performance of needed surgery in aged people. Turville and Dripps<sup>4</sup> found, at the University of Pennsylvania, that the hospital mortality was 4.9 per cent in 974 patients over age 70. This included death from all causes although the actual death rate from anesthesia was not specified. At the University of Iowa in 478 operations upon patients of the age of 80 or above, Ziffren<sup>5</sup> found an overall mortality of 15.1 per cent. This series also did not separate the anesthetic mortality from other causes of death. Bosch, Islami, Tan and Beling<sup>6</sup> reported a mortality in elective procedures of 8.8 per cent and an increase in mortality in emergency procedures to 17.4 per cent. McDermott and Papper<sup>7</sup> reported a total mortality of 4.3 per cent in the anesthetic management of 254 patients with fractures of the hip whose average age was 64.9 years. Mortality included any death that occurred in the postoperative period regardless of how long it occurred after actual operation. There were all told 12 deaths. Three of these patients died of pulmonary embolism in the pre-anticoagulant period, four died in congestive failure, one death occurred with terminal cirrhosis of the liver, three died of pneumonitis, and the cause of death in the last was not clear. It appeared definite that well conducted anesthesia and skillful operation did not add materially to the danger of death in this group of patients. It was difficult to assess the part played by anesthesia in causing these deaths. If anesthesia were implicated at all it probably did not account in any important way for more than one and at most two of these 12 deaths. The low mortality in

this series could not be attributed to the specific type of anesthesia since most forms of anesthesia were employed during the period from 1930 to 1950. The principle of very light general anesthesia was followed in most instances.

Cole<sup>8</sup> stated that "The elderly patient is more susceptible to the ill effects of hypoxia and anoxia, largely because of vascular changes in the brain, heart, etc. For this reason the anesthetic in elderly patients becomes a very important part of the operation." This statement of Cole's suggests that the physiological control of the anesthesia, rather than the specific agent itself, is more important in the ultimate welfare of the elderly patient. This is not peculiar to the elderly patient but is also a reasonable analysis of anesthetic management in any patient. Cole went on to point out in the discussion of specific agents, that in his judgment cyclopropane was adequate and safe and that nitrous oxide and ethylene were not desirable because they do not permit sufficient oxygenation. The criticism of the use of nitrous oxide and ethylene suggests that these agents must always be administered with inadequate oxygen concentrations. These anoxic mixtures are not necessary nor are they practiced in good anesthetic management. In fact, with adequate oxygen, these non-potent gases are among the best of agents for general anesthesia.

In the studies reported by Turville and Dripps<sup>4</sup> in 974 patients, spinal anesthesia was given 448 times, thiopental 206, cyclopropane 193, ether 66, and some form of regional anesthesia 150. A large number of the patients given spinal anesthesia developed hypotension; 33 per cent of the patients who had spinal anesthesia had falls in blood pressure to the level of 60 mm. Hg systolic pressure in normotensive patients or less than one half the original pressure in hypertensive patients. This magnitude of fall in pressure occurred in only 12 per cent of those given general anesthesia. Although one would suppose that falls in blood pressure are highly undesirable in aged patients, Turville and Dripps found that there were relatively few complications of hypotension. It did not appear that hypotension of this degree was responsible for a significant increase in the incidence of myocardial infarction or renal vascular change.

One cannot consider in detail the pharmacology of each anesthetic agent and its suitability for the aged patients. A few pertinent observations, however, can be made for application to these patients.

## TYPES OF ANESTHESIA

1. *Ether*: There has been much discussion of the advantages and disadvantages of ether in many circumstances, including its suitability for the care of the aged. It seems to the present author that an important point is frequently overlooked in this type of discussion. Among the major disadvantages of ether anesthesia are those due to the fact that it is a potent agent. The establishment of deep anesthesia is very easy to accomplish in aged patients with relatively small doses. The profound refractory depression of the circulation is particularly evident with ether overdosage. The first sign of overdosage may be sudden circulatory collapse. Elderly subjects do not usually develop a preliminary tachycardia and tachypnea as ether anesthesia deepens. Time is apparently telescoped for these subjects and the effects of profound etherization become evident with much smaller quantities and much earlier in the course of anesthesia. It is not inferred, however, that ether cannot be used satisfactorily in the aged. It can and has been used to good advantage provided that only the lightest plane of surgical anesthesia or the stage of analgesia is utilized. The important point is that the anesthetic depth must be light with this agent and its administration skillfully performed, realizing that very small quantities can achieve relatively profound depths of anesthesia.

2. *Cyclopropane*: This is an agent which also evokes controversy in the field of geriatrics. Opponents of its use cite the fact that its potential for inciting cardiac irritability makes it unsuitable for elderly patients who may have cardiac arrhythmias. The ease of depression of ventilation with cyclopropane is also cited as a disadvantage in that oxygenation of the blood, despite the high concentration of oxygen in the inhaled atmosphere, may be difficult. More particularly, the excretion of carbon dioxide may be impaired resulting in respiratory acidosis during anesthesia and postanesthetic hypotension and ventricular arrhythmias. These criticisms and objections are valid but, as in the case of ether, they may be overcome by the assistance or control of ventilation and the utilization of the lightest planes of general anesthesia.

Emphasis has been made twice about the value of light anesthesia for elderly patients. It should also be added that it is usually possible to provide good working conditions for the surgeon even with the lightest planes of anesthesia. When relaxation is not totally adequate

under these conditions, a satisfactory surgical field can be achieved more safely by the use of a relaxant than the deepening of anesthesia. Considerable care must be exercised when relaxants are employed to avoid the possibility of overdose of the anesthetic since the "natural" protection of laryngospasm against the potent agents may be eliminated.

3. *The Nonpotent Gases:* Ethylene and nitrous oxide may be considered together since they cannot provide the deepest planes of surgical anesthesia. In aged patients, however, it is usually possible to achieve surgical anesthesia of a satisfactory depth with either one. Ethylene is enough more potent than nitrous oxide so that a somewhat deeper plane of anesthesia can be achieved than with nitrous oxide. Ethylene is explosive and nitrous oxide is not. As far as is known, neither agent has any intrinsic toxic effect upon any organ system in the presence of adequate oxygenation and efficient ventilation. It is important at this point to lay to rest one of the myths in the discussion of anesthesia for the elderly patient. It is frequently stated that ethylene and nitrous oxide are unsuitable or, in fact, dangerous because of the anoxia they produce. If these agents are used for young, robust patients without supplementation this criticism is valid. In the aged patient, however, these agents are more than satisfactory in the majority of patients because anesthesia of satisfactory depth can be achieved with an adequate supply of oxygen and without demonstrable toxicity. In fact, in the modern practice of general anesthesia in geriatrics, ethylene and nitrous oxide should be considered the agents of choice for elderly patients provided an adequate concentration of oxygen is used (more than 25 per cent).

4. *Intravenous Anesthesia:* Intravenous anesthetic agents produce general anesthesia with all the attendant advantages and disadvantages of general narcosis. There are several drugs in current use. Most of them are rapidly acting barbiturates. In elderly patients doses as small as 50 mg. of Pentothal Sodium or Surital Sodium may produce significant depression of respiration and circulation. These drugs, if used in the elderly, must be given with extreme caution in dilutions which permit the injection of precisely determined doses (0.5 to 2.5 per cent) as a basal hypnotic for the maintenance of anesthesia with nitrous oxide oxygen or ethylene and oxygen. They must not be used in aged patients as the sole anesthetic drug.

5. *Rectal Anesthesia:* It is generally advised that the use of Avertin

and Pentothal by rectum be avoided in elderly patients because in the doses satisfactory for production of basal narcosis considerable hypotension may develop. This generalization seems to be a rational and safe one and yet does not jibe totally with actual clinical experiences. The cases reported by McDermott and Papper<sup>7</sup> include the use of Avertin in their earlier case reports. This agent in elderly patients did not appear to increase the mortality despite the fact that it increased the incidence of hypotension.

6. *Local Anesthetic Agents:* If local or regional anesthesia is satisfactory for the surgeon's requirement and for the personality of the patient, they appear to offer maximum safety. A major hazard in the use of these agents is the matter of total dose. In this respect the local anesthetics are the same as the general anesthetics and the narcotics. Elderly patients do not tolerate the doses used for younger patients. Therefore, smaller concentrations of local drugs and smaller total doses should be both satisfactory and safer in the aged.

7. *Spinal Anesthesia:* Spinal anesthesia has been used and advocated by many. The major disadvantages of this method are the relatively high instance of hypotension and the difficulty of assuring effective correction once it has occurred. It has been pointed out above, that hypotension does not per se appear to increase the mortality rate.

It must also be mentioned that postoperative psychosis is among the important complications of both spinal and general anesthesia in aged patients. Seven per cent of the patients reported by Turville and Dripps<sup>4</sup> were irrational after operation. They do not state whether this irrational period was prolonged or whether it could be considered psychotic. It has also been an observation of the clinicians who watch with interest the more subtle changes after surgical procedures that "grandfather is not the same after his prostatectomy." One can only speculate whether the precipitation of irrational behavior or even a psychotic episode might not be associated with cerebral anoxia due to the effect of spinal or general anesthesia. Perhaps the sclerotic vessels of the elderly reduce the margin of safety compared to that of younger adults. It must be reemphasized that this is only speculative. Further observations along these lines might be quite fruitful.

8. *The Relaxants:* The relaxants are not so valuable in the management of aged patients as they are in those with greater muscle power and greater "resistance" to the effects of anesthetic agents. However, the

employment of relaxants appears to be rational as a substitute for added depth of anesthesia should this be necessary for elderly patients. It is of particular importance to be certain that prolonged respiratory depression does not ensue with the use of these agents. Conservative dose administration is essential and the preservation of spontaneous breathing or the frequent recourse to testing for the return of spontaneous respiration when controlled respiration is used is mandatory.

### POSITION

Most anesthetized patients tolerate unusual positions on the operating table poorly. Therefore, when postural change is required for the completion of surgical operation, it is essential that movements be made slowly, gradually, and gently to minimize the call for circulatory compensation in which these patients show deficiencies.

In the postoperative period, sedative drugs must be used in small doses or omitted entirely to avoid the side effects produced by narcotics which are apt to be more harmful in the aged than in younger patients. Aspirin and phenobarbital (not an analgesic) are frequently satisfactory in achieving comfort in the postoperative period.

The point of view expressed in this presentation can best be summarized by Rink's<sup>9</sup> advice to the anesthesiologist whose responsibility includes the care of the aged, "When faced with a wet and slippery road on a dark night, a first class driver does not alter his techniques in any essential way. He merely redoubles his normal safeguards and precautions. He avoids rapid acceleration and braking, but he reaches his destination very nearly as quickly and safely as he does under good conditions."

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